DOCUMENT RESUME

ED 081 615 SE 016 632

TITLE	Environmental Education Exercises, Senior High 9-12.
INSTITUTION	Bourbon County Schools, Paris, Ky.
SPONS AGENCY	Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.
PUB DATE	Nov 72
NOTE	49p.; Revised Edition
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Curriculum Guides; Ecology; *Environmental Education; Instructional Materials; Interdisciplinary Approach; *Learning Activities; *Lesson Plans; Natural Resources; *Secondary Grades; *Teaching Guides
IDENTIFIERS	Elementary Secondary Education Act Title III; ESEA Title III

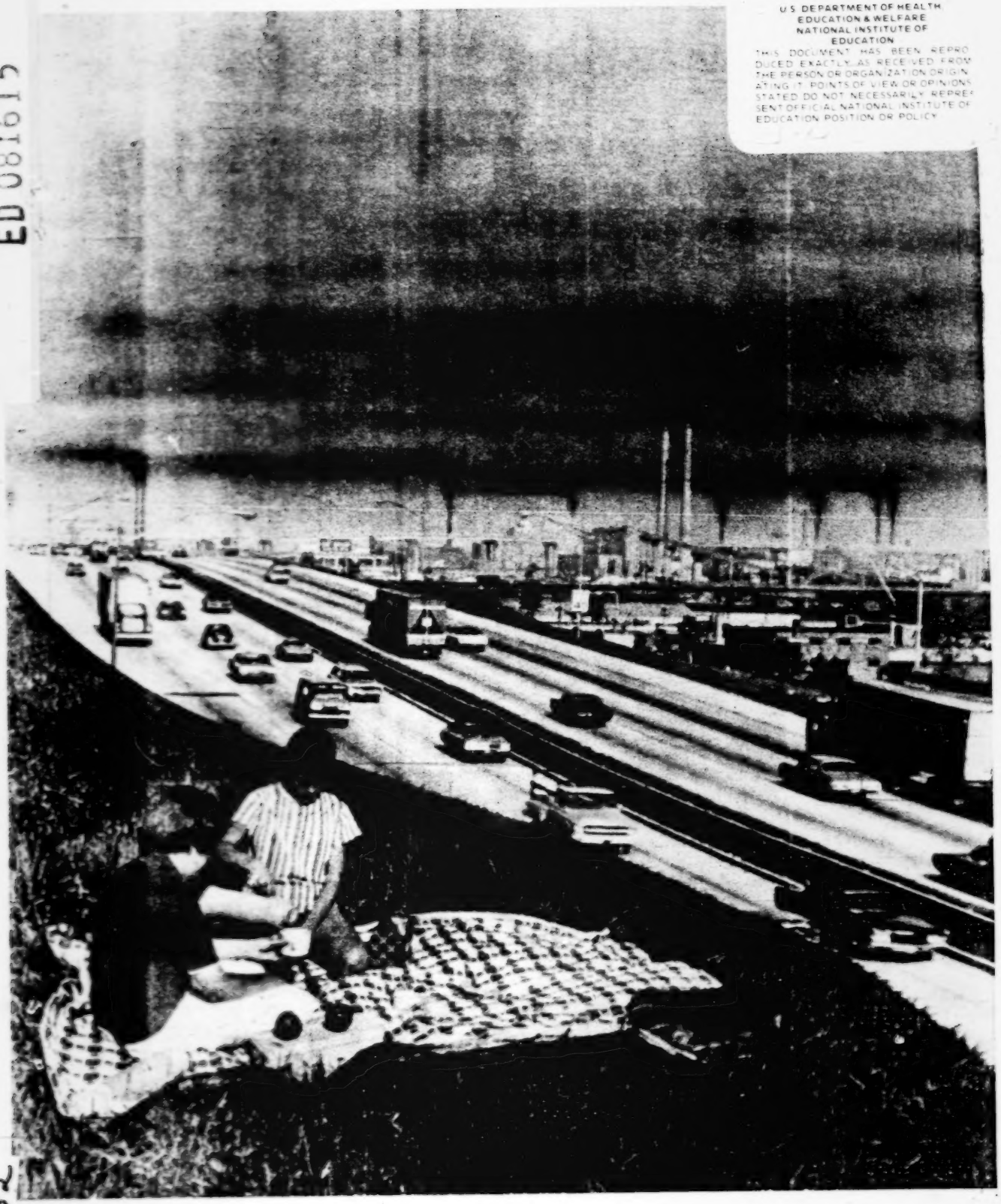
ABSTRACT

Selected and prepared by classroom teachers, these environmental education exercises were developed to be incorporated into specific subject matter areas, not to provide an additional course or unit. Activities in the teacher's guide for senior high grades 9-12 are directed toward biology, language arts, science, and social studies. Each of the 34 exercises enumerates in outline form the title of the lesson, behavioral objectives, materials needed, major activities, follow-up activities, evaluation questions or objectives, and reference materials. Charts or diagrams are included where necessary to supplement the explanations. This work was prepared under an ESEA Title III contract. Related documents are SE 016 629 - SE 016 631. (BL)

ED 081615

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ENVIRONMENTAL EDUCATION EXERCISES



Bourbon County Schools
Environmental Education Department
Paris, Kentucky 40361

SENIOR HIGH
9-12

FILMED FROM BEST AVAILABLE COPY

E 016 632

TABLE OF CONTENTS

Page

BIOLOGY EXERCISE PLANS BY ROY MOSIER
- Exercise #1, Trees..... 4
- Exercise #2, Can You Find the Trees in the Forest?..... 5
- Exercise #3, Tree Study..... 6
- Exercise #4, The Hemlock..... 8
- Exercise #5, Indirect Method of Determining Tree Heighth..... 9
- Exercise #6, What Tree Am I?..... 9
- Exercise #7, Effect of Flooding on Pine Seedlings: Effect of Submergence on 2 Classes of Seedlings--Very Young Seedlings and 1-Year Old Seedlings..... 10
- Exercise #8, Forest Communities..... 11
- Exercise #9, Succession on the School Grounds..... 12
- Exercise #10, The Behavior Stomates..... 14
- Exercise #11, Chromatographic Analysis of Leaf Pigments..... 15

LANGUAGE ART EXERCISE PLANS BY SALLY KINNEY
- Exercise #1, Differentiating Between Fact and Opinion..... 19
- Exercise #2, Reading to Distinguish Between Main Ideas and Details..... 19
- Exercise #3, Recognizing Metaphors, Similes and Symbols..... 20
- Exercise #4, Presenting a Panel Discussion..... 22
- Exercise #5, Using Our Senses..... 23
- Exercise #6, How the Writer Uses Research and Observation..... 23
- Exercise #7, Reading With a Purpose..... 24

LANGUAGE ARTS EXERCISE PLANS BY LINDA PORTER
- Exercise #1, Science Fiction..... 27
- Exercise #2, Keeping a Diary or Logbook..... 27
- Exercise #3, Letter Writing..... 28
- Exercise #4, Poetry..... 29
- Exercise #5, Environmental Vocabulary..... 30
- Exercise #6, The Persuasive Speech..... 33

SCIENCE EXERCISE PLANS BY CECIL GRIMES
- Exercise #1, Air Pollution..... 35
- Exercise #2, Weather..... 35
- Exercise #3, Sounds of Nature: Songbirds..... 36
- Exercise #4, Oxygen-Deficient Water: A Concern of the Conservationist..... 37

SOCIAL STUDIES EXERCISE PLANS BY DUANE STEWART
- Exercise #1, Vanishing Wildlife..... 40
- Exercise #2, Man's Use of Metals: A Two-Sided View..... 41
- Exercise #3, Water Resources: The Need for Conservation..... 41
- Exercise #4, Population Explosion..... 42
- Exercise #5, Industrial Pollution and Industrial Society..... 43
- Exercise #6, Solid Waste: What Can We Do With It?..... 44

FOREWORD

The enclosed "Exercises" were selected and prepared by classroom teachers. They were developed to be incorporated into specific subject matter areas and not to provide an additional course or unit.

Many teachers have been teaching environmental topics and several of these are included. Programs from around the country were reviewed and selections made from these that were applicable to our situation.

Several "Exercises" were intended to be used in the out-of-doors. Many school grounds have a variety of plants and animals which can be used for outdoor studies.

BOURBON COUNTY SCHOOLS
ENVIRONMENTAL EDUCATION DEPARTMENT
HAROLD GROOMS, COORDINATOR
PARIS, KENTUCKY 40361

November, 1972
(Revised Edition)

TITLE III, ESEA
REGION IV-B
400 LAFAYETTE PARKWAY
LEXINGTON, KENTUCKY 40503

ED 081615

BIOLOGY EXERCISE PLANS

Incorporating Environmental Studies

SENIOR HIGH SCHOOL LEVEL

Compiled by:

Mr. Roy Mosier
Science Department Chairman
Bardstown High School
Bardstown, Kentucky

EXERCISE #1

Title of Lesson: Trees

I. Importance of Trees
   A. Value of Trees
      1) Trees help clean up the air, particularly in heavily polluted areas.
      2) If idle, non-productive land is planted in trees, erosion can be greatly reduced.
      3) Trees may be planted on highway right-of-ways to control soil erosion and add beauty to the landscape.
      4) Trees are valuable on school grounds as an "outdoor laboratory" for teaching students about nature, etc.
      5) Trees produce wood, a major natural resource, used in many ways in our modern society:
         a) lumber for buildings, furniture, etc.
         b) wood for paper
         c) chemicals
         d) charcoal, etc.
   B. Other Value of Trees
      1) Trees increase the value of property (particularly in urban areas).
      2) Trees and shrubs are effective in slowing the force of wind.
      3) Trees absorb sound and tend to make sounds less intense.
      4) Trees produce oxygen for us.
      5) Nearly half of all living organic materials are found in forests.
      6) Trees have a certain "air conditioning" value, cooling and humidifying the air.

II. Importance to Animals
   A. Trees are Essential to many Kentucky Wildlife Species
      1) Provide a place for nesting.
      2) Escape from enemeis.
      3) Weather protection.
      4) Harboring other creatures which are food for wildlife.
   B. Wildlife in Kentucky which use the Forest
      1) Deer
      2) Wild turkey
      3) Opossum
      4) Ruffed grouse
      5) Squirrel
      6) Duck (some species)
      7) Raccoon and others
   C. Wildlife Food
      1) Acorns-Oak trees
      2) Walnuts-Walnut trees
      3) White ash, beechnut, sassafras and black locust seeds
      4) Pine seeds
      5) Hickorynuts-Hickory trees
      6) Wild cherry and hackberry fruit, wild grapes

III. Conservation of Trees
   A. Trees are Damaged by Toxic Gases in the Air
      1) Sulfur dioxide
      2) Hydrogen fluoride
      3) Ozone and others

B. The Trend of some Contractors toward Blending New Buildings into the Existing Landscape rather than Clearing all the Land before Development. This has Saved a lot of Valuable Trees from Destruction.
C. Recycling Paper and other Timber Products can help Conserve Trees
D. The Forest has 3 Major Enemies
   1) Insects
   2) Disease
   3) Fires
E. The Great Majority of All Forest Fires are Man Made
F. Good Logging Practice can be Beneficial to a Forest

Bibliography:

Forests for the Future, U.S. Department of Agriculture, Forest Service, 1969
Great American Forest, Rutherford Platt, Englewood Cliffs, New Jersey, Prentice-Hall, 1965
Introduction to Trees, by Michael H. Bevans, Garden City, New York, Hanover House, 1954
People, Cities and Trees (PA-958), U.S. Department of Agriculture, Government Printing Office, 1970
Plants and Environment, R. F. Daubenmire, New York, John Wiley and Sons, 1959
Questions Answered About Trees, 1001, Rutherford Hayes Platt, New York, Dodd Mead, 1959
Secret Life of the Forest, Richard M. Ketchum, New York, American Heritage Press, 1970
Tree Farms, Harvest for the Future, Dorothy and Joseph Dowdell, Indianapolis, Bobbs-Merrill, 1965

EXERICSE #2

Title of Lesson: Can You Find the Trees in This Forest?

Behavioral Objectives: At the conclusion of this lesson, the student will be able to:

1) Name 5 trees from the forest
2) Name 3 trees that begin with the letter "P"

Activity:

1) The word box is really a forest in which more than 20 trees are planted.
2) Start with any letter and try to spell out the full name of a tree.
3) You can move in any direction: up, down, crosswise, or diagonally, but without skipping a square.
4) You may repeat the same letter more than once:

M	A	S	H	I
U	P	B	D	L
O	L	E	A	B
M	H	C	R	I
W	E	Y	F	G

5) Clues: Cherry, Alder, Birch, Elm, Ash, Apple, Fir, Maple, Beech, Cedar, Larch, Yew, Peach, Mulberry, Pear, Pepper, Plum, Fig, Crab

Follow-up Activity:

Use a tree identification book such as Master Tree Finder by Mary Theilgaard Watts and identify the trees found on school grounds.

EXERCISE #3

Title of Lesson: Tree Study

Behavioral Objectives: At the conclusion of these activities, the student will be able to:

1) Recognize his tree any time of the year
2) To produce a perfect leaf print
3) When given a leaf, fruit (if present), color of bark, texture of the bark, the student will be able to identify 10 trees from the school grounds
4) List 2 characteristics used to identify trees

Materials Needed:

1) Notebook
2) Colored pencils

Definitions:

1) Trunk: the main part of a tree
2) Branches: limbs of a tree
3) Petiole: attaches the thin green blade to the stem
4) Alternate
5) Opposite

I. Fall
1) What is the color of the tree leaves? Sketch showing the shape. Make a leaf print.
2) Describe what you see of the tree's roots. In how many ways are the roots useful to the tree?
3) How high on the trunk from the ground are the first branches? What is the color of the bark? Is the bark smooth or rough? Are the ridges fine or coarse? Are the furrows between the ridges deep or shallow?
4) Describe the leaf, paying special attention to its shape, its edges, its veins or ribs, and the length and thickness of its petiole. Are the leaves set opposite or alternate upon the stem? At what date do the leaves begin to fall from your tree? At what date are they all off the tree?
5) Do you find any fruit or seed upon the tree? If so, describe and sketch it and tell how you think it is scattered.

II. Winter
1) Make a sketch of the tree showing its shape as it stands bare. Does the trunk divide into branches or does it extend through the center of the tree and the branches come off its sides? Are the twigs at the end of the branches coarse or fine? Is the bark on the branches like that on the trunk?

2) Examine twigs of the tree in February. What is their color? Are they shiny, rough or sticky?

III. Spring

1) At what date do the young leaves appear upon your tree? What color are they?
2) Are there any flowers on your tree in the spring? If so, how do they look?
3) At what date does your tree stand in full leaf? What color is it now? What birds do you find visiting it? What insects?

Additional Activities:

Materials: 12x15 thick glass plate, tube of printer's ink (green or black), 2 6-inch rubber rollers (used by photographers), small bottle of kerosene to dilute the ink, container of gasoline to clean the rollers and glass, sheets of good quality paper 8½x11. Place a few drops of ink upon the glass and spread it about with the roller until there is a thin coat of ink upon the roller and a smooth patch in the center of the glass. (It should never be so liquid as to "run" as this will cause the outline to blur.) Ink the leaf by placing it on the inky surface of the glass and passing the inked roller over it once or twice until the veins are filled. Place the inked leaf between 2 sheets of paper and roll once with a clean roller. 2 prints are made at each rolling. To make a crayon print, lay a leaf, vein side up, on a firm, smooth surface. Hold securely in place and rub the side of a soft crayon (from which all paper has been removed) over the paper, making all strokes go the same way. Cut out the print and mount on chalkboard or drawing paper. To make an ink-pad leaf print, place leaf, vein side down, on an ordinary ink pad (such as those used for rubber stamps). Cover with newspaper and rub firmly to ink it. Now place leaf, inked side down, on a piece of drawing paper. Cover with a clean piece of newspaper and rub gently but firmly, being careful not to let the paper slip or the print will be blurred. Be sure to let dry before touching. You can make a leaf skeleton by stripping leaves down to their skeletons. Students can see the beautiful and intricate network of veins that transport food and raw materials throughout the whole leaf. An old hairbrush or shoebrush with animal bristles (soft) will be needed. A "pounding board" can be made by tacking a 10-inch square of old carpet to a piece of board. Select a fresh green leaf and place it, top side up, on the pounding board. Hold firmly with one hand and tap it gently with the brush until all the fleshy part is worn away leaving only the skeleton. Press the skeleton between the pages of a magazine with a weight on top for 2 days, then mount on a piece of construction paper.

Evaluation:

Test over the behavioral objectives.

References:

1) Audubon Society, Set FC2, Trees, 60 flash cards
2) Know Your Trees, Collingwood, G. H. and Brush, Warren D.
3) An Introduction to Trees, Kieran, John
4) A Pocket Guide to Trees, Platt, Rutherford
5) Field Book of American Trees and Shrubs, Schuyler, Mathews

Bibliography:

A Guide to Field Identification, Brockman-Zim - Merriles, Golden Press, 1968
Trees of North America, Brockman - Zim-Merriles, Golden Press
Forest and Trees of the U.S., chart, 22x33 inches
Life of the Forest, chart, 11½x16 inches
Trees and Plants, Audubon, charts, 14x21
Experiments in the World of Plants, Part I, II and III
An Introduction to Ecology, 6 filmstrips
Forest Resources, slides
Populations and Biomass, filmstrip
A Day in Algonquin Park, record
Breeding Pollution Resistant Trees for Cities, magazine article
Plants, Effect of Air Pollution On, magazine article
Plants, Effect of Sound On, magazine article

EXERCISE #4

Title of Lesson: The Hemlock

Behavioral Objectives: At the conclusion of this investigation, each student will be able to:

1) Identify a hemlock at any time of the year
2) Describe how the hemlock seeds are scattered
3) List 5 characteristics of the hemlock

Materials Needed:

1) Hemlock tree
2) Book on trees

Activities:

1) The hemlock's foliage makes it an efficient winter shelter for birds.
2) What is the general shape of the hemlock? Sketch an outline of the tree. What type of bark does the tree have?
3) How tall does it grow? What is the color of the foliage? How are the leaves arranged on the twigs? Are all the leaves about the same size?
4) Break off a leaf and describe its shape; its petiole. Does the leaf of any other evergreen have a petiole? What is the color and marking of the hemlock leaf above? Below? At what time of the year are new leaves developed?
5) Are the hemlock cones borne on the tip of the twigs or along the side? How many sides beneath each scale?
6) Describe and sketch a hemlock seed.
7) Make drawings of the following: the hemlock twig showing the arrangement of the leaves, showing the single leaf enlarged, cone, cone scale, seed.
8) What animals feed upon the hemlock seed? What birds find protection in the hemlock foliage during winter?

Additional Activities:

1) Use any cone bearing tree and follow the procedure used for the hemlock.
2) Develop a procedure of tree study to use with deciduous trees.

Evaluation:

Test over the behavioral objectives.

EXERCISE #5

Title of Lesson: Indirect Method of Determining Tree Heighth

Behavioral Objectives: At the conclusion of this lesson, the student will be able to:

1) Use 3 known values and by using ratio and proportion derive a 4th related value
2) Take the length of a yardstick's shadow and the length of a tree's shadow and determine the height of a tree

Materials Needed:

1) Yardstick
2) Tape measure

Activities:

1) Select trees to be measured.
2) Set the end of a yardstick on the ground.
3) Measure the length of the yardstick's shadow, using a tape measure.
4) Measure the length of the tree's shadow.
5) Use the following proportion by:

$$\frac{\text{Length of yardstick}}{\text{Length of yardstick's shadow}} = \frac{\text{Height of tree}}{\text{Length of tree's shadow}}$$

Multiplying the yardstick's length by the length of the tree's shadow and divide this by the length of the yardstick's shadow.

Additional Activities:

1) This method may be used to determine the height of a building.
2) Measure the height of objects by the 12 to 1 ratio method.

Evaluation:

Test over the behavioral objectives.

EXERCISE #6

Title of Lesson: What Tree Am I?

Behavioral Objectives: At the conclusion of these activities, the student will be able to:

1) Name the double tree
2) Name the sweetest tree
3) Name the tree that is nearest the sea
4) Name a tree that is a personal pronoun

Activities:

1) Quizzes like the following are similar to riddles and word games.
2) Some depend upon a double meaning, a change of spelling or a quick mental conclusion.
3) They stimulate quick thinking and verbalization.
4) Quiz:
   a) A tree that is a personal pronoun. -YEW (You)-
   b) A tree found in some churches. -ELDER-
   c) A tree that is well-groomed. -SPRUCE-
   d) A tree that means to waste away in grief. -PINE-
   e) What tree is nearest the sea? -BEECH-
   f) What tree will keep you warm? -FIR (Fur)-
   g) The tree used in kissing. -TULIP (Two Lip)-
   h) The fisherman's tree. -BASSWOOD-
   i) The sweetest tree. -SUGAR MAPLE-
   j) Name the double tree. -PEAR (Pair)-
   k) The canine tree. -DOGWOOD-
   l) A tree used to describe pretty girls. -PEACH-

Additional Activities:

1) Collect leaves from the above trees.
2) Learn how to identify the trees.
3) Find out about each tree (where they grow, how they are used and their fruit).

EXERCISE #7

Title of Lesson: Effect of Flooding on Pine Seedlings: Effect of Submergence On 2 Classes of Seedlings--Very Young Seedlings and 1-Year Old Seedlings

Behavioral Objectives: At the conclusion of this lesson, the student will be able to:

1) Germinate pine seeds
2) Describe the effects of submergence on the root systems, degree of chlorosis of leaves and growth of the pine seedlings
3) Run a controlled experiment

Materials Needed:

1) Pine seeds
2) Light meter
3) Pine seedlings thermometer
4) Pots
5) Greenhouse

Activities:

1) Collect seed from several kinds of pine.
2) Establish a greenhouse germination technique.
3) Germinate the seed in greenhouse pots.
4) At the beginning of the experimental period, the pots should be submerged in large pans so that the water level can be brought up to cover the tops of the seedlings.

5) Different groups of seedlings could be tested under different periods of submergence: 2 weeks and 4 weeks.
6) After the experimental period, a few seedlings of each test group should be dug up for observations of roots.
7) The pots should then be allowed to drain and remain at optimum moisture (in greenhouse) for an additional period of 2 weeks.
8) Effect on seedlings can be observed in terms of: a) root system, b) degree of chlorosis of leaves, c) height of growth at end of recovery period and at death of plants.
9) Graph the result of each condition in each time interval.
10) A control group for each species should be run concurrently (grown in the same kind of soil and kept at optimum conditions).
11) Take measurements of water temperature at frequent intervals during the period of submergence.
12) Light intensity could be determined by using a light meter.
13) There should be at least 10 seedlings in each group.
14) The soil must be carefully prepared to insure the greatest amount of uniformity in all conditions, other than those being tested.

Additional Activities:

This procedure could be used for angiosperms. Corn and beans could be used. The corn representing monocots and the beans representing dicots.

Evaluation:

Questions on the behavioral objectives.

References:

1) Fundamentals of Plant Physiology, Ferry, J. F. and Ward, H. S.; 1959, Macmillan Company, New York
2) Plant Physiology, 2nd edition, Meyer, B. S. and Anderson, D. B.; 1952, D. Van Nostrand Company, Princeton, New Jersey

EXERCISE #8

Title of Lesson: Forest Communities

Purpose: To help students understand the nature of a forest community, its structure and management for the benefit of all living things

Behavioral Objectives: At the conclusion of this lesson, the student will be able to:

1) List 3 ways plants affect each other
2) Name the main food producer of an oak and beech forest
3) Name the most dangerous forest creature
4) Define: niche, producer, consumer and decomposer
5) Describe 3 ways forests are valuable to man (other than forest products)
6) List 3 ways man can insure a continued supply of wood products for the future

Activities:

1) Visit a managed forest. Note: Topography, soil types, kinds of trees

and management practices. Or have local or district forestry personnel visit the classroom to explain forest management.
2) Name the kinds of plants that grow in the forest you visited: a) type of trees and shrubs, b) type of ground cover.
3) What type of soil was in the forest and what factors other than the soil determine the types of plants that live there?
4) What is the climax plant in this community?
5) Which plant species is the main food producer and what animals live off this food?
6) What is the most dangerous forest creature (tick)?
7) Name the organisms that fit into the following niches: producer, consumer, parasite, scavenger and decomposer. Explain how each niche is essential to the health of the community.
8) Visit the school library or the local public library and answer the following pertinent questions: a) Other than products from trees, in what ways are forests of value to man (recreation, hunting, watershed, windbreak, influence on climate, addition of humus to soil)?, b) How can we insure a continued supply of wood for the future (reforestation, fire control, pest control, improved use of waste wood, product research)?, c) List 3 ways man disrupts or destroys the forest community (fire, overcutting, mismanagement, permitting overgrazing by wildlife)., d) How can an individual get the most use from his forest (conserving water, preservation of trees for aesthetic values, recycling paper, use glass products that are recycleable such as plates, cups, bottles, etc.)?

Evaluation:

Test over the behavioral objectives.

References:

1) The Plant Kingdom, 2nd edition, Bold, Harold C.; Englewood Cliffs, Prentice-Hall, 1964
2) The Living Forest Life Nature Library, McCormick, Jack
3) The Forest Yearbook of Agriculture, Farb, P.
4) The Plants, Went, Frits W. and the Editors of Life; New York Times, 1963
5) "The Forest", film, color, 29 min., USDA, Motion Picture Service, Washington, D. C., 20025
6) "Life in the Deciduous Forest", film, color, 19 min., International Film Bureau, 332 S. Michigan Avenue, Chicago, Illinois, 60604
7) "The World We Life In", filmstrip

EXERCISE #9

Title of Lesson: Succession On the School Grounds

Purpose: To study the stages of succession in a limited area: the school grounds

Behavioral Objectives: At the conclusion of this lesson, the student will be able to:

1) Define plant succession
2) Be able to recognize the different stages from bare rock to the hardwood climax

3) Be able to describe how disasters such as fire and storms affect successions
4) Describe how succession affects the balance of nature
5) List 3 ways the succession determines the wildlife of a community

Activities:

1) Show film, "Plant Succession".
2) Students are taken to school grounds where they observe and make notes on the following as related to succession: a) Trees: types, size, compare those planted to ones having grown naturally, locations: do you see small ones growing in flower beds?, what do you find growing under trees?, b) Shrubs: types, size, where growing? why?, give reason for growth of those not planted (offshoots from original plant)., c) Flower Beds: note growth of small trees, weeds, grass in beds, what would happen here if growth is not controlled?, compare uncontrolled growth here to controlling succession in a field, relate controlling growth here to controlling succession in a forest., d) Lawn: observe the uncontrolled growth here of weeds., e) Asphalt Areas: weeds in cracks and low areas filled with soil.
3) Relate succession on the school grounds to succession on uncultivated fields, bare rocks and other areas.
4) Relate limiting factors of the school environment to succession.
5) Relate the benefits and problems of succession to: a) plants, b) animals (wildlife), c) man, d) soil, e) water, f) minerals.
6) List and discuss the various stages of succession on the school grounds.
7) How would disasters affect succession?
8) How could you recognize an area that has reached climax?
9) How does a study of succession on the school grounds show the importance of controlling succession in a forest?
10) How does succession affect the balance of nature in a community?
11) Is a climax stable? Why or why not?

Follow-up Activities: Discuss:

1) Succession will help to determine the wildlife of a community.
2) An unkept flower bed being overtaken by weeds is an example of succession.
3) Succession is beneficial to plants, soil, water, wildlife, man. It may create problems requiring conservation measures.

Evaluation:

Test over behavioral objectives.

Reference Materials:

1) Fundamentals of Ecology, Odum, Eugene P. and Howard, T.; High School Biology, BSCS, Green Version
2) "Plant Succession", film, color, 15 min., McGraw-Hill, Text Films, 330 W. 42nd Street, New York, New York, 10018

Title of Lesson: The Behavior Stomates

Most of the higher plants have stomata on the upper and/or lower surface of the leaves. These stomata open and close to varying degrees under different environmental conditions.

Behavioral Objectives: After completing this lesson, the student will:

1) Make a stomata impression using collodion
2) Prepare a glass slide of the impression
3) Determine the kinds of leaves that have stomates on both sides
4) Answer the question, "Are stomata of different sizes found on the same plant?"

Materials Needed:

1) Microscope
2) Glass rod
3) 2-way skotch tape
4) Slides
5) Tweezers
6) Ether
7) Collodion

Activities:

1) After the collodion has been rubbed on the leaf surface, remove with a pair of tweezers.
2) Place the collodion impression on a glass slide that has been prepared with 2-way tape.
3) Place side of impression that was next to leaf, away from slide.
4) Observe under the microscope using reduced light.
5) Mix a small amount of ether with collodion to thin due to thickness of collodion.
6) Do not be discouraged if you don't get a good impression the first time. Perfect impressions can be made after several tries.
7) Make impressions of the upper and lower leaf surface of 10 to 20 different plants of one kind.
8) Make impressions of plants to be studied under as many different environmental conditions as possible.
9) Record behavior: a) percent full open, b) percent 3/4 open, c) percent 1/2 open, d) percent closed, e) percent tightly closed.
10) Does stoma opening and closing follow a pattern that is determined by the environmental condition?
11) Record the results graphically.

Evaluation:

Test over behavioral objectives.

References:

1) Principles of Plant Physiology, Bonner, J. F. and Galston, A. W.; 1952, W. H. Freeman and Company, San Francisco, California
2) Anatomy of Seed Plants, Esau, Katherine; 1960, John Wiley and Sons, New York, New York
3) Cells: Their Structure and Function, Mercer, E. H.; 1962, Doubleday and Company, Inc.

Title of Lesson: Chromatographic Analysis of Leaf Pigments

Purpose: To separate the different color pigments that may be in leaves

Behavioral Objectives: At the conclusion of these activities, the student will be able to:

1) Run a chromatogram
2) Determine color pigments found in spinach leaves
3) Determine the characteristics of pigments
4) Analyze any leaf for pigments
5) Develop a solvent by using varying concentrations of ether and acetone

Materials Needed:

1) Pipette (made from glass tube that has been heated and drawn out to a finepoint)
2) Funnel
3) Cleaning tissue
4) Cheesecloth
5) Mortar and pestle or blender
6) Acetone
7) Fine sand
8) Thawed spinach
9) Test tube rack
10) Wax pencil
11) Scissors
12) Filter or chromatography paper
13) Corks to fit test tubes
14) Test tubes (large 25x200 mm)
15) Paper clip
16) Developing solution (8% acetone, 92% petroleum ether)
17) Forceps

Activities:

1) How does the biochemist know that the green color of leaves is the result of a mixture of several pigments? He must have some method of separating the pigments from the leaves.
2) Assemble the test tube (as in the diagram), but do not add the solution.
3) Handle the filter of chromatography paper with forceps at all times.
4) Adjust the length of paper so that the lower end is 10 mm from the bottom of the test tube. Mark the tube mm above this.
5) Remove the paper strip from the hook.
6) Pour developing solution into the test tube 5 mm below the mark on the tube.
7) Place cork in the tube (without paper attached).
8) Place tube in a test tube rack.
9) Grind 3 spinach leaves with sand and 5 ml of acetone in a mortar or use a blender and omit sand.
10) Place a layer of cheesecloth and then a layer of cleaning tissue in a funnel.
11) Pour the acetone (which contains extracted pigment) into funnel: collect filtrate: a) what is the color of the filtrate?, b) is there any evidence that more than 1 pigment is dissolved in the acetone?

12) While holding the paper with forceps, place a drop of the pigment extract with the find pointed pipette. Allow to dry. Continue this until 4 drops have been added, one on top of the other.
13) Remove cork from tube and hang the strip on the hook. Insert cork into test tube.
14) Be sure the pigment spot does not touch the developing solution.
15) Allow the developing solution to reach the hook--remove and dry the paper.

Interpretation:

1) How may bands of color can you see?
2) How many bands of chlorophyll?
3) What other colors?
4) Why were you unable to see these by just looking at the leaf?
5) Do you think all leaf pigments are soluble in acetone? Why or why not?
6) In what characteristic must the pigments have differed?

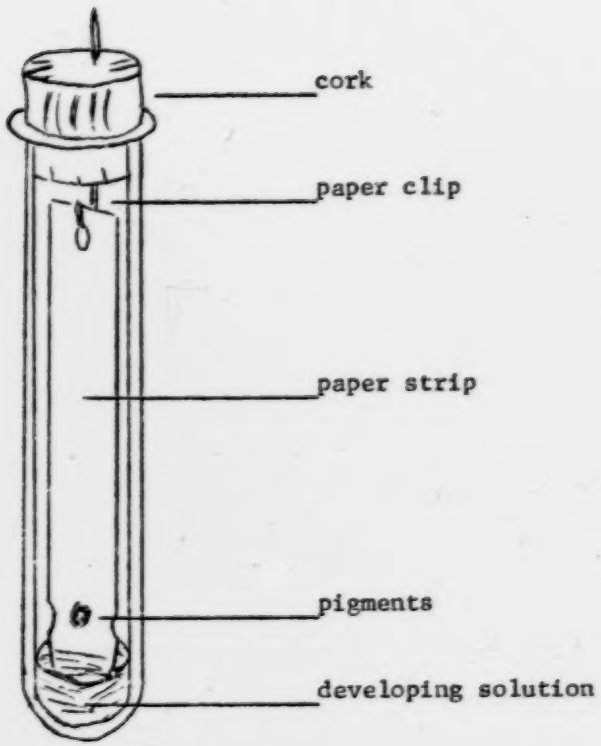
Additional Activities:

1) Why were the pigments extracted with acetone? What liquids besides acetone can be used to extract pigments from the leaf?
2) Are there any pigments that are not extracted by acetone? How can these be extracted?
3) What effect does the kind of developer have on chromatography? Try 100% acetone, 100% petroleum ether, 100% alcohol and different mixtures of any 2 or all of these.
4) Does the nature of the pigments you are trying to separate affect the results?
5) Use the leaves from a maple tree and determine if the methods can be used to extract the chlorophyll.

References:

1) Plant Pigments, Stegner, R.; Rand-McNally and Company, Chicago, Illinois, 1967
2) "Paper Chromatography", film, color, 14 min., BSCS, Thorne, 1961

..EXERCISE #11..



LANGUAGE ARTS EXERCISE PLANS

Incorporating Environmental Studies

SENIOR HIGH SCHOOL LEVEL

Compiled by:

Mrs. Sally Kinney
English Instructor
Harrison County High School
Cynthiana, Kentucky 41031

EXERCISE #1

Title of Lesson: Differentiating Between Fact and Opinion

Purpose:

To recognize the difference between fact and opinion

Behavioral Objectives: At the conclusion of this exercise, 75% of the students will be able to:

1) Pick out an example of opinion in something they read
2) Pick out an example of a fact used to back up an opinion
3) Differentiate between editorializing and news reporting in an edition of a daily newspaper

Materials Needed:

1) Magazine articles concerning environmental subjects such as population growth, pollution, strip mining, depletion of natural resources, etc.
2) Newspapers
3) Silent Spring and other books concerned with environmental subjects
4) Films concerning environmental subjects

Activities:

1) Discuss the differences between fact and opinion, bringing in examples from the magazine and newspapers.
2) Read articles to pick out facts and opinions.
3) Discuss the various opinions brought out in the articles and the facts that are used to back up these opinions.
4) View a film to determine the use of facts and opinions in this media.
5) Invite a journalism teacher and journalist to visit class and explain the use of fact and opinion in writing for a newspaper.
6) Write a class newspaper dealing with the problems of the environment using materials gained from activities 2 and 4, and student opinions pointing out that opinions are not to be used in news stories.

Follow-up Activities:

Watch a television news program or special to determine use of fact and opinion.

Evaluation:

1) Students should write a 300-word theme presenting a) the opinions of 2 writers and the 3 facts which each used to back up his opinion, b) then, the student's own opinion of the issue and 3 facts to support this opinion.
2) Students' articles for the class newspaper will be judged to determine whether they have used facts and/or opinions appropriately.

EXERCISE #2

Title of Lesson: Reading to Distinguish Between Main Ideas and Details

Purpose:

of factual material

Behavioral Objectives: At the conclusion of this exercise, 75% of the students should be able to:

1) Pick out the main idea in a magazine article on an environmental problem such as the danger of a certain animal becoming extinct
2) Scan a magazine article to find the main idea
3) Write a precis of a magazine article
4) Find 10 details in a magazine article

Materials Needed:

1) Pamphlets
2) Magazine articles
3) Parts of books
4) Encyclopedias
5) Newspaper articles
6) All of the above materials dealing with birds and animals which are becoming extinct or other environmental problems

Activities:

1) Discuss the difference between main ideas and details and the relation between them.
2) Read pamphlets and articles from materials in the Bourbon County Schools Materials Center and pick out the main ideas from these articles.
3) Discuss method of precis writing.
4) Write a precis of an article read.
5) Discuss the value and techniques of scanning reading material.
6) Practice scanning pamphlets or articles about various environmental problems.
7) Present orally in class discussion main ideas gleaned from materials scanned.
8) Discuss the difference between the method used when reading for main ideas and that used when reading for details.
9) List 10 details from an article read, having students re-read articles they read in activities 2 and 6.

Evaluation:

1) Grade precis written in activity 4 to determine whether students have grasped the main ideas of the article read.
2) Grade list prepared in activity 9 to determine whether students understand what is meant by details as related to main ideas.

EXERCISE #3

Title of Lesson: Recognizing Metaphors, Similes and Symbols

Purpose:

To point out to students how various plants and animals are used in figurative language

Behavioral Objectives: At the conclusion of this 2-week lesson, students should know that:

1) Plants and animals are often used in literature as symbols, similes and metaphors; and they should be able to cite at least 2 examples of each
2) Our everyday speech contains many similes and metaphors based on natural life; and they should be able to cite at least 2 examples of each
3) Our modern world uses many symbols, similes and metaphors based on natural life; and they should be able to cite at least 2 examples of each

Materials Needed:

1) Short stories that make use of symbols, similes and metaphors based on natural life such as The Scarlet Ibis by James Hurst
2) Poems that make use of symbols, similes and metaphors based on natural life such as "The Skaters" by J. G. Fletcher and "The Daffodils" by W. Wadsworth
3) Books on wildflowers, birds and animals
4) Magazines
5) Reference books

Activities:

1) Read The Scarlet Ibis with the idea that the bird is used as a symbol and discuss the story.
2) Read poems and discuss the poet's use of figurative language based on nature.
3) Go to the library to do research in periodicals and reference books to find symbols based on nature used by countries: a) country-Eagle, b) athletic teams-Wildcats, Bearcats, c) products-Swan, Tiger, d) cars-Impala, Cougar, e) clubs and fraternities-Lions, Elks.
4) Go to the library to locate and read short stories and poems which contain symbols, similes and metaphors based on natural life and discuss the use of these elements in the story and/or poem.
5) Go to the library to research the examples found in activities 3 and 4 to determine whether their qualities make them appropriate or inappropriate as symbols as they are used.
6) Students will go into natural setting to look for flowers, plants, animals which they think would make good symbols and to determine what they could represent.
7) Students will go to the library and/or a materials center to find flowers, birds, animals, etc. in periodicals and reference books to create similes and metaphors using the information they find.

Follow-up Activities:

Each student will make a poster which will represent some aspect of their study of similes, metaphors and symbols. Use posters for classroom display.

Evaluation:

1) Students will be expected to make a list of at least 10 items from nature used as symbols.

2) Students will be expected to make a list of at least 10 metaphors or similes heard in everyday speech based on natural life.
3) Students will write a paragraph telling why some natural item would be a good symbol for a particular thing.
4) Students will write a paragraph telling why some natural item is or is not a good symbol for some product, country, team, club, etc.

EXERCISE #4

Title of Lesson: Presenting a Panel Discussion

Purpose:

To give students an opportunity to represent material located during a period of research

Behavioral Objectives: During this exercise, 75% of the students will learn to:

1) Research a subject and find various opinions and facts presented about this subject
2) Take 3 notes on opinions and 3 notes on facts about a subject
3) Talk for 2 or 3 minutes about subject using both fact and opinion

Materials Needed:

1) Tape recorder to help students simulate a radio program
2) Magazines and sections of books dealing with environmental problems
3) Films dealing with environmental problems

Activities:

1) Discuss what a panel is and how it functions pointing out that the best panels are those which present a variety of points of view.
2) Organize pupils into groups of 4 or 5 and let them decide upon topic to research and what part each student will take on panel.
3) Visit library and/or a materials center to find information about environmental problems.
4) Have students take notes on each panel to see which group presents the most information.
5) Have students separate points made by panel into fact and opinion relying upon their votes as a source of information.

Follow-up Activities:

Let most successful panel re-do their presentation for another class or form presentations over local radio station.

Evaluation:

1) Evaluate notes taken by each student during his research to see if he has 3 notes on fact and 3 on opinion.
2) Evaluate each student's part on the panel to determine whether he presented the information collected.
3) Evaluate each student's notes from panel discussions to determine whether he listened to the material presented.

EXERCISE #5

Title of Lesson: Using Our Senses

Purpose:

To give students the experience of writing creatively about what they observe through their senses

Behavioral Objectives: At the end of this lesson, 75% of the students will be able to:

1) Write a 100-word paragraph describing 5 things they have seen, heard, smelled or felt during a 30-minute period in an outdoor setting
2) Point out in their paragraph 5 words that help the reader understand exactly the experience described in the paragraph

Materials Needed:

Grammar book section dealing with writing descriptive paragraphs and using sensory language

Activities:

1) Discuss the importance of using words which are specific in description such as colors, sizes, shapes, textures.
2) Discuss the use of comparisons and contrasts in describing things that are unfamiliar to the reader such as "dandelions sprinkled across the field like yellow polka dots on green velvet".
3) Take a walk and take notes on things heard, seen, smelled or felt while out-of-doors.
4) Read paragraphs aloud to show similarities among people's observations and differences in their descriptions of what they saw.
6) Re-write paragraph which student considers his most successful.

Evaluation:

Grade student's paragraph to determine whether the student recorded 5 impressions from his experience outside and used 5 exact words to describe his experience.

EXERCISE #6

Title of Lesson: How the Writer Uses Research and Observation

Purpose:

To show the importance of the powers of observation and the skills of research to the writer of short stories and essays

Behavioral Objectives: At the conclusion of this exercise, 75% of the students will be able to:

1) See in the world around them subject matter for creative writing
2) Adapt information gathered from research and observation to imaginative, creative writing
3) Combine material gathered from research with that gathered from observation into imaginative, creative writing

Materials Needed:

1) Short stories and essays dealing with wildlife such as "The Life and Death of a Western Gladiator" by C. G. Finney, "Vulture Country" by J. D. Stewart, "The Swamp Buck" by S. Olson, "Voice of the Night", by H. B. Kane and "Flora's First Year" by Sterling North
2) Grammar book, section on writing stories

Activities:

1) Read stories and essays dealing with wildlife.
2) Discuss differences between stories and essays.
3) Visit outdoor laboratory with purpose of writing short paper about nature based on observation.
4) Discuss differences between formal and informal essays.
5) Write a formal or informal essay about nature.
6) Visit a library and find information on some form of wildlife.
7) Examine materials from environmental section of a materials center for additional information on wildlife.
8) Discuss importance of vivid, sensory language.
9) Write a short story using some form of wildlife as a main focus of interest. Read some of the students' short stories aloud in an outdoor setting and discuss writer's use of description of natural surroundings.
10) Discuss student's use of vivid, sensory language in their stories such as colors, sounds, textures, etc.

Follow-up Activities:

1) Discussion of what the students have observed, read and heard that is of interest.
2) Showing of the film, "Mallard", 43 minutes, color, ordered free from the Department of Fish and Wildlife Resources.

Evaluation:

1) Grade student essays from activity 5 to determine whether student has transferred what he has observed to writing.
2) Grade student stories from activity 9 to determine whether the student has combined knowledge from research with those from his observation.

Reference Materials:

1) English Grammar and Composition, grade 9, Warriner, et. al.; Harcourt, Brace
2) Outlooks Through Literature, Scott Foresman

EXERCISE #7

Title of Lesson: Reading With a Purpose

Purpose:

To make students aware of more than the plot and characters in a book length work of fiction

Behavioral Objectives: After this exercise, 75% of the students will be able to:

1) Understand the importance of the physical setting in work of fiction which they read
2) Understand that they can learn much more about nature while reading for pleasure
3) Give a book report which does something other than summarize the book's plot

Materials Needed:

Library books with an emphasis on natural surroundings and wildlife such as Call It Courage, Island of the Blue Dolphin, Robinson Crusoe, Call of the Wild, The Yearling, Goodbye My Lady, When the Legends Die, Let the Hurricane Roar

Activities:

1) Discuss the fact that writers often use vivid description of the surroundings in a story.
2) Read Stuart's short story, "The Slip Over Sweater", to show how the writer has used description as a background for his story.
3) Visit a library to check out books in which climate, natural surroundings and/or wildlife play an important part.
4) Discuss books in small groups emphasizing the settings and pointing out how these had a bearing on the plot, the characters, etc.
5) Have students in each group pick the story which seemed to give them the most insight to nature and have the students who read this book be on a panel with those chosen from other groups. Have panel present a discussion on "The Importance of Setting in Works of Fiction".

Follow-up Activities:

Have students write a paragraph about the use of natural surroundings in works of fiction.

Evaluation:

Grade book reports by moving from group to group to determine whether students are describing setting and whether they are making the setting of their book vivid to the listeners. Evaluation in this exercise is informal and is not to be used in determing student grades.

LANGUAGE ARTS EXERCISE PLANS

Incorporating Environmental Studies

SENIOR HIGH SCHOOL LEVEL

Compiled by:

Mrs. Linda Porter
English Instructor
Bourbon County High School
Paris, Kentucky 40361

EXERCISE #1

Title of Lesson: Science Fiction

Purpose:

To give students opportunities to read science fiction and to write their own based on some of today's environmental issues

Behavioral Objectives: At the end of this exercise, students will be able to:

1) Differentiate among fact, opinion and fiction
2) Select the most important points in an article
3) Obtain information without plagiarizing
4) Create an original story from collected factual information

Materials Needed:

1) Science fiction books and stories
2) Current articles on the environment

Activities:

1) The class will read some science fiction written before 1950 to see what is predicted for the present time. Examples: Brave New World by Huxley; 20,000 Leagues Under the Sea by Jewels Vern; "Buck Rogers" comic strip.
2) They will do research on the current environmental situation. Then they will choose one aspect of interest to study.
3) Each student will write a science fiction short story based on the information found on his special subject.

Follow-up Activities:

Each student will read a science fiction novel and try to find any factual basis for its plot and detail.

Evaluation:

Students will be given a grade for their research and short stories. They will report on their novel in class.

Reference Materials:

Possible short story subjects:
1) World War III
2) The Next Ice Age
3) Our Over-Populated World
4) Fashions In the Year 2000
5) When the Insects Take Over

EXERCISE #2

Title of Lesson: Keeping a Diary or Logbook

Purpose:

To give students opportunities in recording their experiences

Behavioral Objectives: At the end of this exercise, the students will be able to:

1) Put experiences into words
2) Understand the importance of details in description
3) Use sensory images, metaphor, similes, personification in descriptive writing

Materials Needed:

Some sort of notebook for recording activities

Activities: (for 1 week)

1) 30 minutes each day, students will go to the outdoor laboratory. While there, they will write their impressions and reactions to the surroundings.
2) At the end of the week, students will make a composition from their daily work.
3) Emphasis will be placed on detailed description, metaphors, similes and other forms of expression.

Follow-up Activities:

Oral reading of the composition.

Evaluation:

Papers will be graded on form, content and creativity.

EXERCISE #3

Title of Lesson: Letter Writing

Purpose:

To prepare students to write business and friendly letters correctly

Behavioral Objectives: At the conclusion of this exercise, the students will be able to:

1) Write persuasive letters
2) Write letters of request
3) Write informative letters
4) Differentiate between details and main points

Materials Needed:

1) Addresses of environmental information sources
2) Addresses of Congressmen

Activities:

1) Students will study current available periodicals which deal with ecology. They will distinguish important main points and details.

2) When a topic of interest is found by each student, he will write a letter to find more information.
3) He will study all the material he has received and on the factual information form a logical opinion on the issue.
4) He will write a letter to a Congressman expressing his ideas with the intention of persuading the Congressman to act. He will also ask for a reply.
5) After the student receives the reply, he will write an informative, friendly letter to a friend telling him of the work he has done.

Follow-up Activities:

Students will watch for controversial environmental issues in newspapers and magazines to be used in class discussions.

Evaluation:

Letters will be graded on:
1) Punctuation, grammar, form.
2) Persuasion, quality of information, politeness in requesting and organization of ideas and facts.

Reference Materials:

1) Congressional Report
2) Senior Scholastic
3) Science World
4) Izaak Walton League of America
5) Commissioner of Fish and Wildlife
6) Commissioner of Natural Resources
7) State Department of Agriculture
8) Department of Interior
9) Division of Forestry
10) University of Kentucky Department of Agriculture
11) L. Raymer Jones, Field Representative, Division of Soil and Water Conservation, Route 2, Paris, Kentucky, 40361

EXERCISE #4

Title of Lesson: Poetry

Purpose:

To continue the study of poetry and the appreciation of nature

Behavioral Objectives: At the end of this exercise, the students will:

1) Have a greater appreciation of poetry
2) Realize the destruction of our environment
3) Gain experience in writing poetry
4) Be able to point out and use figures of speech, sensory appeal and descriptive writing

Materials Needed:

1) Nature poems in textbook
2) Other collected poems on nature
3) "Visual Pollution" by J. Weston Walch

Activities:

1) The students will read nature poems in and outside the text and discuss their descriptive elements.
2) They will discuss the conditions of the environment at the time the poems were written.
3) They will use these poems and a film as a guide to write about today's polluted environment. (Have them watch a film which shows the destruction of nature.)
4) They will orally compare the times and the poems to find the changes in nature.

Follow-up Activities:

Students will look for beauty in their environment and write original poetry describing it.

Evaluation:

Students will be graded on their knowledge of the poetry they have studied and on their ability to put the poetic devices into their own poetry.

Reference Materials:

An example of the poetry to be used: adaptation of "Fog" by Carl Sandburg

EXERCISE #5

Title of Lesson: Environmental Vocabulary

Purpose:

Students will increase their vocabulary and their knowledge of the etomology of words

Behavioral Objectives: At the end of this exercise, students will:

1) Know the definitions of the words on the environmental vocabulary list
2) Know the etomology of words

Materials Needed:

Dictionary

Activities: (to be used for ? weeks of vocabulary unit)

1) First half of list will be pronounced on Monday.
2) On Wednesday, students will have looked up the meaning and etomology of the words. The class will discuss the words briefly.
3) On Friday, a spelling and definition quiz will be given .
4) The second half of the list will be given the second week. This will be included in a 36-week vocabulary unit.

Follow-up Activities:

The class will watch for new words to be discussed in class.

Evaluation:

Test on spelling and definitions at the end of each week.

ENVIRONMENTAL VOCABULARY LIST

Air
Air Quality Control Region
Air Quality Standard
Atmosphere
Balance of Nature
Biodegradable
Carbon Monoxide
Conservationist
Contamination
Dam
DDT (Dichloro-Diphenyl-Trichloro-ethane)
Detergents
Ecology
Ecosystem
Food Chain
Ehrlich, Paul
Enzymes
Environment
Environmental Protection Agency (EPA)
Environmental Quotient (EQ)
Erosion
Exploitation
Garbage
Hydrocarbons
Incineration
Insecticides
Internal Combustion Engine
Litter
Mercury
Mine Acid
Morton, Rogers
National Audubon Society
Oxygen
Pesticide
Phosphate
Phosphorus
Pollution
Population
Predator
Primary Treatment
Recycling
Reservoir
Respiratory
Ruckelshaus, William D.
Secondary Treatment
Sierra Club
Smog
Strip Mining
Temperature Inversion
Tertiary Treatment
Thermal Pollution
Water Quality Improvement Action
Zero Population Growth

EXERCISE #6

Title of Lesson: The Persuasive Speech

Purpose:

To teach the elements of a persuasive speech

Behavioral Objectives: At the conclusion of this exercise, students will be able to:

1) Differentiate between fact and opinion
2) Recognize the use of facts to back an opinion
3) Recognize propaganda
4) Present a persuasive speech

Materials Needed:

Environmental information

Activities:

1) Do research.
2) A study will be made of the information to determine factual and unfactual data and opinion.
3) Class will discuss propaganda techniques: a) loaded words, b) influences, c) generalization, d) manipulation of facts, e) plain folks, f) conotations--transfer.
4) Each student will prepare a persuasive speech based on some environmental issue.
5) Students will deliver their speeches and the class will discuss each one on the quality of their persuasion.

Follow-up Activities:

Students will take their speeches to local civics clubs to try and convince them of the need to "do something for our environment".

Evaluation:

Speeches will be graded.

SCIENCE EXERCISE PLANS

Incorporating Environmental Studies

SENIOR HIGH SCHOOL LEVEL

Compiled by:

Mr. Cecil Grimes
Science Instructor
Bourbon County High School
Paris, Kentucky 40361

EXERCISE #1

Title of Lesson: Air Pollution

Purpose:

To study the possible results of smoke, auto exhausts, smog and toxic odors on the environment and living things

Behavioral Objectives: After this exercise, the students will be able to:

1) Identify sources of air pollution and gain an appreciation of the amount of pollution input
2) List means by which individuals and society may improve or alleviate the pollution source

Materials Needed:

1) 2 pyrex test tubes
2) Bunsen burner, matches
3) Lumps of bituminous coal
4) Delivery tube, stoppers
5) 1 glass tube drawn to jet
6) Ring stand

Activities:

1) Set up an experiment to burn coal and determine the chemical changes that take place and the by-products that are emitted into the air.
2) Have students list the physiological and economic effects of air pollution.
3) Discuss the process used by DuPont's, Louisville, Kentucky plant, to control air pollutants.
4) Discuss the problem of pollutants emitted by motor vehicles.

Evaluation:

Identify pollutant sources in Bourbon County and Central Kentucky and recommend methods of combatting the problems.

Reference Materials:

1) People and Their Environment, Brennan, Matthew J., Teacher's Curriculum Guide to Conservation Education, J. G. Ferguson Publishing Company, Chicago, Illinois, 1969
2) Environmental Crisis, Volume 3D, 1970
3) "Air Pollution", set of slides, J. Weston Walch, Portland, Maine
4) "Conservation", set of transparencies, Creative Visuals, 1969

EXERCISE #2

Title of Lesson: Weather

Purpose:

To give students an understanding of the phenomena of weather

Behavioral Objectives: After this exercise, the student will be able to:

1) Identify and classify clouds
2) Explain the basis for weather occurrences and predictions
3) Explain weather symbols and the preparation and interpretation of the U.S. Weather Bureau Surface Weather Maps

Materials Needed:

1) Barometer
2) Wind direction indicator
3) Wind speed indicator
4) Thermometer
5) Hygrometer (relative humidity indicator)
6) U.S. Weather Bureau Surface Weather Maps

Activities:

1) Observe and forecast local weather conditions.
2) Read and record temperature, barometric pressure, wind direction and velocity, relative humidity.
3) Watch television weather reports and discuss in class.
4) Bring daily newspaper weather maps to class.
5) Areas for class discussion: a) Air Masses, b) Fronts, c) Highs/Lows, d) Tornadoes, e) Cyclones, f) Hurricanes, g) Chill-Factor, h) Inversions, i) Classification of Clouds.

Follow-up Activities:

1) Maintain weather recording instruments and predict weather conditions.
2) Discuss and explain any unusual weather occurrences that may occur.

Evaluation:

1) Determine ability of student to identify clouds and their significance by making observation of existing cloud coverage.
2) Class can make 12/24 hour weather prediction on existing conditions and current weather map and compare with meteorologist prediction and outcome.

Reference Materials:

1) "Activities Related to the Aerospace Sciences", pamphlet by Frank, Paul S.; developed by the 1968 Aerospace Workshop, Garrett Company
2) Manual for the Outdoor Teacher, Tri-District Outdoor Education Center, Washington, Ohio
3) Field Ecology, Phillips, Edwin A.; Biological Sciences Curriculum Study

EXERCISE #3

Title of Lesson: Sounds of Nature: Songbirds

Purpose:

1) To improve the student's appreciation for the sounds of nature and

instill an incentive to carry out conservation practices
2) To add depth and motivation to the study of sound in general science and physic classes

Behavioral Objectives: After this exercise, the students will be able to:

1) Explain how birds produce sound
2) Explain how bird sounds differ

Materials Needed:

1) "Songbirds of America", record
2) Chart or pictures of songbirds

Activities:

Listen to record of songbirds and discuss the following:
1) How is the sound physically produced by birds?
2) What is the frequency range?
3) Could there by an ultrasonic range?
4) What is sound classification: music or noise? Why?
5) What is the decibel intensity?
6) Name the birds that you are familiar with that have high and low decibel and frequency outputs (not necessarily songbirds).

Reference Materials:

"Songbirds of America", Allen, Cornell Laboratory of Ornithology

EXERCISE #4

Title of Lesson: Oxygen-Deficient Water: A Concern of the Conservationist

Purpose:

To help students understand the physical and ecological aspects of oxygen-deficient water

Behavioral Objectives: After the completion of this exercise, the students should be able to:

1) Tell how important O_2 is to the decay process of waste materials in our streams, ponds and rivers
2) Explain how an imbalance of O_2 will result from excessive organic waste materials (sewage) being dumped into our streams
3) Tell how the fish and other water life will suffer in an O_2-deficient environment
4) Initiate and/or recommend conservation practices for O_2-deficient water areas in a community

Materials Needed:

1) Powdered milk
2) Methylene blue solution
3) Test tubes

4) Dry yeast
5) Timer

Activities:

1) Demonstrate how increasing the amount of sewage (milk) affects the O_2 demands of the decay organisms by putting a milk solution in 5 test tubes with methylene blue and then adding yeast. When the solution turns colorless, the O_2 in the water will be consumed. Yeast will represent the decay organisms in the surface water. Powdered milk contains sugar and will represent the sewage that is dumped into the river.
2) Demonstrate how detergents interfere with the normal function of O_2 producing plant life: thereby, helping to create O_2-deficient water. This demonstration consists of placing a twig of elodea (an aquatic plant) in a jar of water containing only water. The O_2 produced by each can be measured.
3) Discussion of other means of lowering O_2 content: a) outboard motors, b) heating of water (thermal pollution), etc.

Follow-up Activities:

Visit sewage disposal plant and water treatment plant.

Evaluation:

Have students prepare a report on what their opinion is of the O_2 content of local surface water and methods that may be employed to improve or prevent the pollution problem.

Reference Materials:

1) Environmental Crisis, Volume 3D
2) Probing the Natural World, ISCS, 1970
3) Adventures in Hydrosphere: Physical Study of Water Resources, Mason, Fred J.; Conservation and Environmental Studies Center
4) "Pollution", brochure, Series of Ecological Subjects
5) The Curious Naturalist, magazine, article "Putting the Heat On", (November, 1970)

SOCIAL STUDIES EXERCISE PLANS

Incorporating Environmental Studies

SENIOR HIGH SCHOOL LEVEL

Compiled by:

Mr. Duane Stewart
Social Studies Instructor
Bourbon County High School
Paris, Kentucky 40361

The following is a compact series of lessons dealing with environmental studies that can be utilized by the social studies teacher. These lessons were designed to be used in conjunction with the textbooks currently being used but are readily adaptable to newer adoptions.

The main purpose of these lessons is to educate the students in certain areas of environmental problems without creating a special unit to be presented as a separate study. A study of the environment, as it exists today, lends itself readily to all areas of social studies and should be integrated into the total program without utilizing the hard-sell tactic often employed.

Certainly, there are many areas of environmental studies not covered in this brief unit, so teachers are encouraged to expand or delete information when applicable to the various courses of study.

Current Texts Used in Social Studies at Bourbon County High School

Grade	Course	Text
9	Introduction to Social Studies	Our Changing World
9-10	World Geography	World Geography Today
10	World History	The Record of Mankind
11	United States History	Rise of the American Nation
12	United States Government	Magruder's American Government
12	Problems of American Life	Today's Problems
12	Sociology	Sociology: An Introduction

EXERCISE #1

To be used in conjunction with Chapter 9, Our Changing World.....

Title of Lesson: Vanishing Wildlife

Purpose:

This lesson should create and stimulate an awareness of the problem of the extinct and near extinct animals of the world

Behavioral Objectives:

1) Student should learn the names of various animals that are nearing extinction (they should be able to name 10 different species)
2) Student will learn the various reasons for the decreasing numbers of the various species

Materials Needed:

1) "Vanishing Herds", film, color, 10 minutes, free from the Kentucky Department of Fish and Wildlife Resources, Frankfort, Kentucky, 40601
2) "Wildlife", slides, available from the Bourbon County Schools Materials Center
3) "These Animals are Threatened with Extinction", poster from T.V. series, Wild Kingdom, available from the Bourbon County Schools Materials Center
4) "The Mammals: Vanishing Wildlife", Life Educational Reprint, available from the Bourbon County Schools Materials Center
5) "The Birds: Vanishing Wildlife", Life Educational Reprint, available from the Bourbon County Schools Materials Center

Activities:

1) The teacher will show the film, "Vanishing Herds", and the film slides in conjunction with the text representation.
2) Students will make oral reports based on the various animals that are facing extinction and make recommendations for the preservation of such animals.

EXERCISE #2

To be used in conjunction with Chapter 10, Our Changing World.....

Title of Lesson: Man's Use of Metals: A Two-Sided View

Purpose:

1) To give a view of American iron and steel production as seen through the eyes of the manufacturer
2) To show how the ill planning and misuse of the minerals and metals has shortened the supply and will create problems in the future (solutions?)

Behavioral Objectives:

1) Students will demonstrate a working knowledge of the uses of iron and steel in the modern world
2) Students will know that without the abundance of iron, steel and other minerals, life, as we know it, would be greatly altered

Materials Needed:

1) "America Grows with Iron and Steel", American Iron and Steel, available from the Bourbon County Schools Materials Center
2) "Minerals and Metals", slides, available from the Bourbon County Schools Materials Center
3) "Mineral Conservation Today", filmstrip, available from the Bourbon County Schools Materials Center

Activities:

1) Filmstrips and slides will be shown to the class with a discussion of each.
2) Class will discuss the following topic: Life Without Iron and Steel.

EXERCISE #3

To be used in conjunction with Chapters 10-13, Our Changing World.....

Title of Lesson: Water Resources: The Need for Conservation

Purpose:

To make every student aware of the water conservation problem in America (and Kentucky) and to stimulate a true desire to do something about it

Behavioral Objectives:

1) Each student will make personal observations of water pollution in Bourbon County and will report his findings
2) Students in groups will prepare posters showing the various uses of water
3) Each student will make his own suggestions for the solution of the water pollution in Bourbon County

Materials Needed:

1) "Beargrass Creek", film, L. Raymer Jones, Field Representative, Division of Soil and Water Conservation, Route 2, Paris, Kentucky, 40361
2) "The Year of Disaster", film, Modern Talking Pictures, 9 Garfield Place, Cincinnati, Ohio
3) "Pollution in Bourbon County", pamphlet, available from the Bourbon County Schools Materials Center

Activities:

1) Showing of the 2 films in conjunction with Chapter 11, section on Water or with Chapter 13, Man and Conservation.
2) Copies of "Pollution in Bourbon County" are to be distributed to the class and read by the students.
3) A field trip to the various polluted areas of Bourbon County can give first-hand knowledge to the class. Field trip should also include a visit to the Paris Water Plant.
4) If time permits, a trip to Dix Dam at Burgin, Kentucky would be a valuable lesson in the production and usages of hydro-electric power and coal-produced electricity (both types are produced at Dix Dam).
5) The class could play the Monopoly-type game called "Dirty Water" produced by Urban Systems, Inc., 1033 Massachusetts Avenue, Cambridge, Massachusetts and available from the Bourbon County Schools Materials Center.

Evaluation:

No specific test will be given. Posters will be graded, and reports will be evaluated by the teacher.

Reference Materials:

1) "Water Pollution", slide set, available from the Bourbon County Schools Materials Center
2) "Water Conservation", available from the Bourbon County Schools Materials Center
3) "Pollution: The Great Lakes", filmstrips, available from the Bourbon County Schools Materials Center

EXERCISE #4

To be used in conjunction with Chapters 14 and 29, Our Changing World.....

Title of Lesson: Population Explosion

EXERCISE #4 (cont.)

Purpose:

To familiarize students with the current problem and statistics of population

Behavioral Objectives:

1) Student will demonstrate his familiarity with current statistics on the population crisis by taking a brief test
2) Student will write short stories and plan debates on population problems

Materials Needed:

1) "Population and Biomass", filmstrip
2) The Population Bomb, Ehrlich, Paul
3) The Population Challenge, U.S. Department of the Interior
4) "Famine and Population Control", cassette recording

Activities:

1) Present filmstrip in conjunction with Chapters 14 and 29.
2) Debate: limiting families to 2 children.
3) Fiction writing: class should be divided into 2 groups and each write a short story with the following titles: The Great Food War, 1992-1994 and The Return of the Plague.
4) Let selected students draw up guidelines and principles of governmental interference in family planning.
5) Teacher should present to students guide sheets and statistics from Paul Ehrlich's, The Population Bomb.

Evaluation:

Brief test over current population statistics and projected future statistics and proposed solutions.

Reference Materials:

Materials may be found in the Materials Center on the Bourbon County High School Campus, Paris, Kentucky, 40361

EXERCISE #5

To be used in conjunction with Chapter 17, Our Changing World.....

Title of Lesson: Industrial Pollution and Industrial Society

Purpose:

In any highly industrialized country, the life style of its inhabitants is usually rather advanced. The price they pay for this advanced civilization is sometimes high than is first realized. To determine the results of advanced industry pollution is the purpose of this lesson.

Behavioral Objectives:

1) Each student will be able to name the several types of industrial pollution and will demonstrate his understanding of its effect on the society
2) Students will learn examples of life styles in industrial and metropolitan areas

Materials Needed:

1) "Smog: The Air Pollution Game", Urban Systems, Inc., 1033 Massachusetts Avenue, Cambridge, Massachusetts and available from the Bourbon County Schools Materials Center
2) "Air Pollution", slides, available from the Bourbon County Schools Materials Center
3) "Effect of Air Pollution on Our Lives", transparencies, available from the Bourbon County Schools Materials Center
4) "Ecology of the City", slides, available from the Bourbon County Schools Materials Center
5) "Water Pollution", slides, available from the Bourbon County Schools Materials Center
6) "Expedition: City Fallout", film, 28 minutes, Public Health Service, Audio Visual Facility, Atlanta, Georgia

Activities:

1) Students will play "Smog: The Air Pollution Game" mainly for enjoyment but fundamental understanding of air pollution should be gained from the game.
2) Instructor will present slides, etc. showing smog in the cities and will hold discussions after each showing. "The Ecology of the City" slides will be stressed and students will look in depth at the various life styles of city dwelling in comparison to rural family life.

EXERCISE #6

Title of Lesson: Solid Waste: What Can We Do With It?

Purpose:

Solid waste is one of the greatest environmental problems in Bourbon County. There is no sanitary means of solid waste disposal for the county residents. This lesson is not meant to solve the problems of Bourbon County, but to give the students insight to a problem now side-stepped in their own community.

Behavioral Objectives:

1) Septic tanks are the only means of solid waste disposal in Bourbon County. Therefore, the students will learn the function of the tanks.
2) The class will be able to list and explain other methods of sanitary solid waste disposal
3) The class will learn first-hand knowledge of at least 1 sanitary landfill in their community and will be able to explain the value of such a project

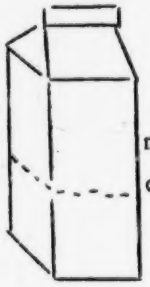
EXERCISE #6

Materials Needed:

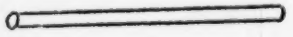
1) "A Decent Burial", film, color, 12½ minutes, L. Raymer Jones, Route 2, Paris, Kentucky, 40361
2) "The Third Pollution", film, 28 minutes, color, Public Health Service, Audio Visual Facility, Atlanta, Georgia
3) Various pamphlets available from the Bourbon County Schools Materials Center
4) Pictures of the Bourbon County Environmental Education Area available from Harold Grooms, Coordinator, Environmental Education, Bourbon County Schools, Paris, Kentucky, 40361. These pictures show the "before" story of the school's dumping ground.
5) Various constructional materials including cardboard boxes, small hand tools for digging (flower gardening tools would be suitable), drinking straws, fine gravel (shoebox full), 1 half-gallon milk carton, 1 quart milk carton, 1 cup of sand, small amount of putty and various amounts of water

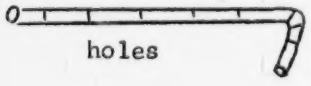
Activities:

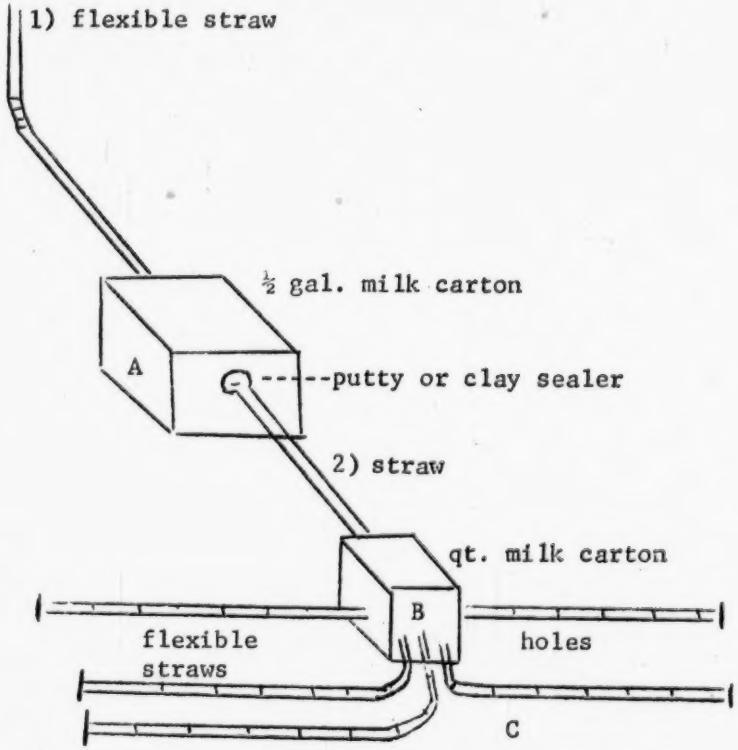
1) Instructor will show the films concerning landfill projects with general class discussion following showing.
2) Students will take a tour of the Bourbon County Environmental Education Area and will note that the area was formerly a garbage dump. Pictures of the old dump will enable students to compare the area with its former state.
3) Students will make a model septic tank according to the diagram included with this exercise.
4) A field trip to the Paris City Dump could also be arranged.



plastic straws







1) Mixed water and sand used for waste products
2) Straw between Tank A and Tank B will be placed higher than drainfield straws

A) Septic Tank
B) Distribution Box
C) Drainfield

(This model will be placed in the ground with gravel in the drainfield ditches.)

The following is a general outline designed to help the Instructor work the environmental lessons into the general outline of the text.....

Exercise	Text	Chapter(s)
1-Vanishing Wildlife	Our Changing World	9
2-Man's Use of Metals: A Two-Sided View	Our Changing World	10
3-Water Resources: The Need for Conservation	Our Changing World	10-13
4-Population Explosion	Our Changing World	14 or 29
5-Industrial Pollution and Industrial Society	Our Changing World	17
6-Solid Waste: What Can We Do With It?		
4-Population Explosion	World Geography Today	3
5-Industrial Pollution and Industrial Society	World Geography Today	46
3-Water Resources: The Need for Conservation	World Geography Today	48
1-Vanishing Wildlife	World Geography Today	24-28
2-Man's Use of Metals: A Two-Sided View	World Geography Today	46-47
4-Population Explosion	The Record of Mankind	2 and 27
5-Industrial Pollution and Industrial Society	The Record of Mankind	16
4-Population Explosion	Magruder's American Government	28
5-Industrial Pollution and Industrial Society	Magruder's American Government	28
2-Man's Use of Metals: A Two-Sided View	Magruder's American Government	26
2-Man's Use of Metals: A Two-Sided View	Problems of American Life	16
3-Water Resources: The Need for Conservation	Problems of American Life	20
1-Vanishing Wildlife	Problems of American Life	20
5-Industrial Pollution and Industrial Society	Problems of American Life	1
4-Population Explosion	Problems of American Life	2
5-Industrial Pollution and Industrial Society	Sociology: An Introduction	10
4-Population Explosion	Sociology: An Introduction	12
2-Man's Use of Metals: A Two-Sided View	Sociology: An Introduction	9
1-Vanishing Wildlife	Sociology: An Introduction	2
3-Water Resources: The Need for Conservation	Sociology: An Introduction	9
2-Man's Use of Metals: A Two-Sided View	The Record of Mankind	17
1-Vanishing Wildlife	The Record of Mankind	13
3-Water Resources: The Need for Conservation	The Record of Mankind	27
2-Man's Use of Metals: A Two-Sided View	Rise of the American Nation	23
5-Industrial Pollution and Industrial Society	Rise of the American Nation	42

Exercise	Text	Chapter(s)
4-Population Explosion	Rise of the American Nation	42
1-Vanishing Wildlife	Rise of the American Nation	22
3-Water Resources: The Need for Conservation	Rise of the American Nation	22
1-Vanishing Wildlife	Magruder's American Government	23
3-Water Resources: The Need for Conservation	Magruder's American Government	23